

# **EXHIBIT 3**

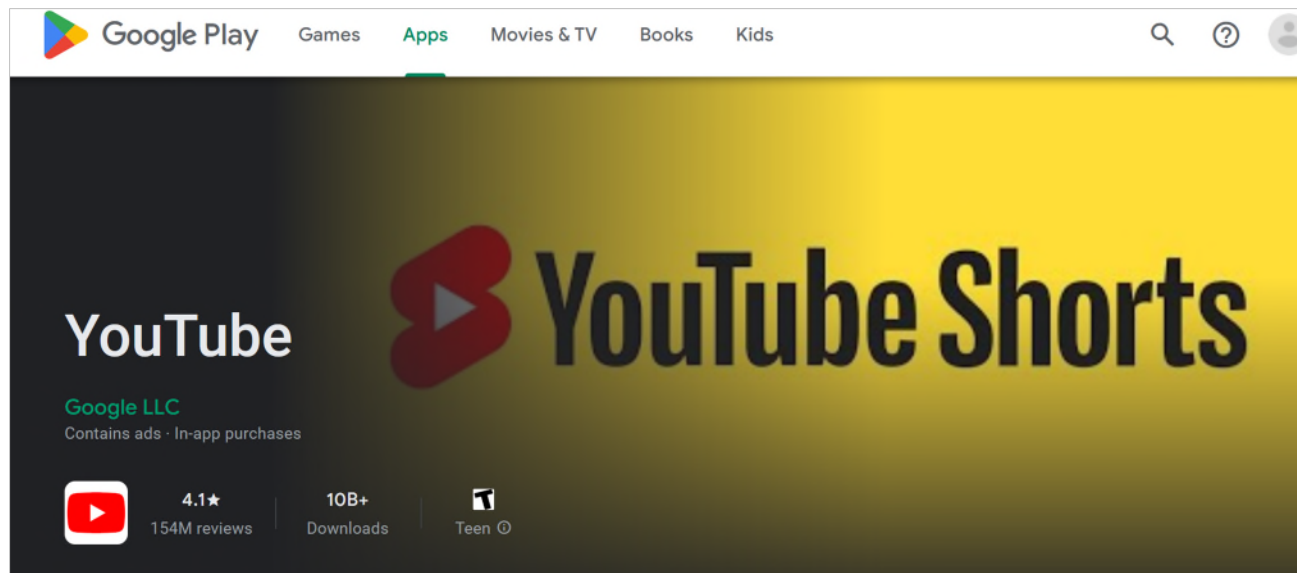
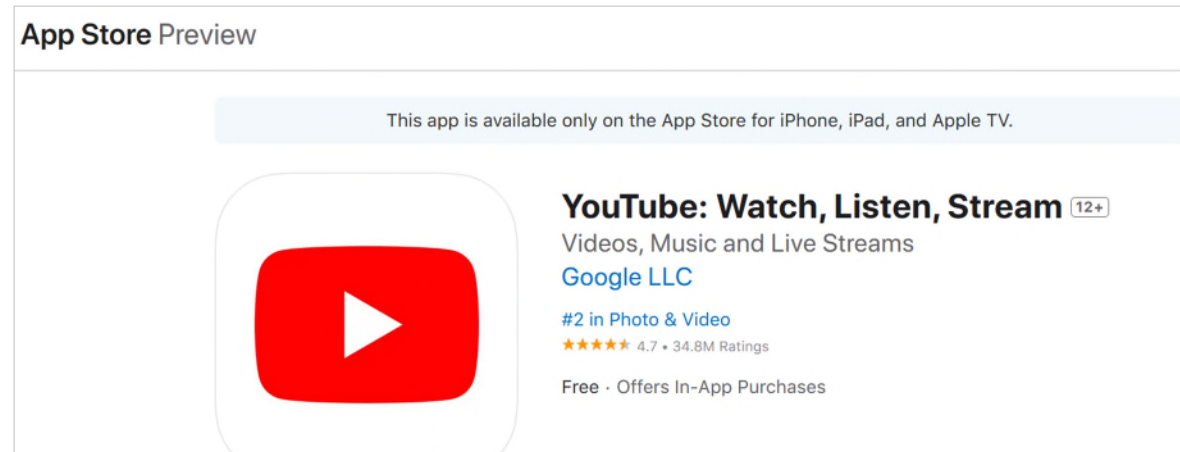
## U.S. Patent No. 10,771,849, Claim 1

A method comprising:	
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**receiving** audio and video segments encoded in a digital encoding format and with an encoding rate;

**YouTube uses two kinds of Players (“YT Player”) for receiving encoded audio and video segments:**

YouTube App Players (e.g., iOS, Smart TVs, streaming devices, Chrome)



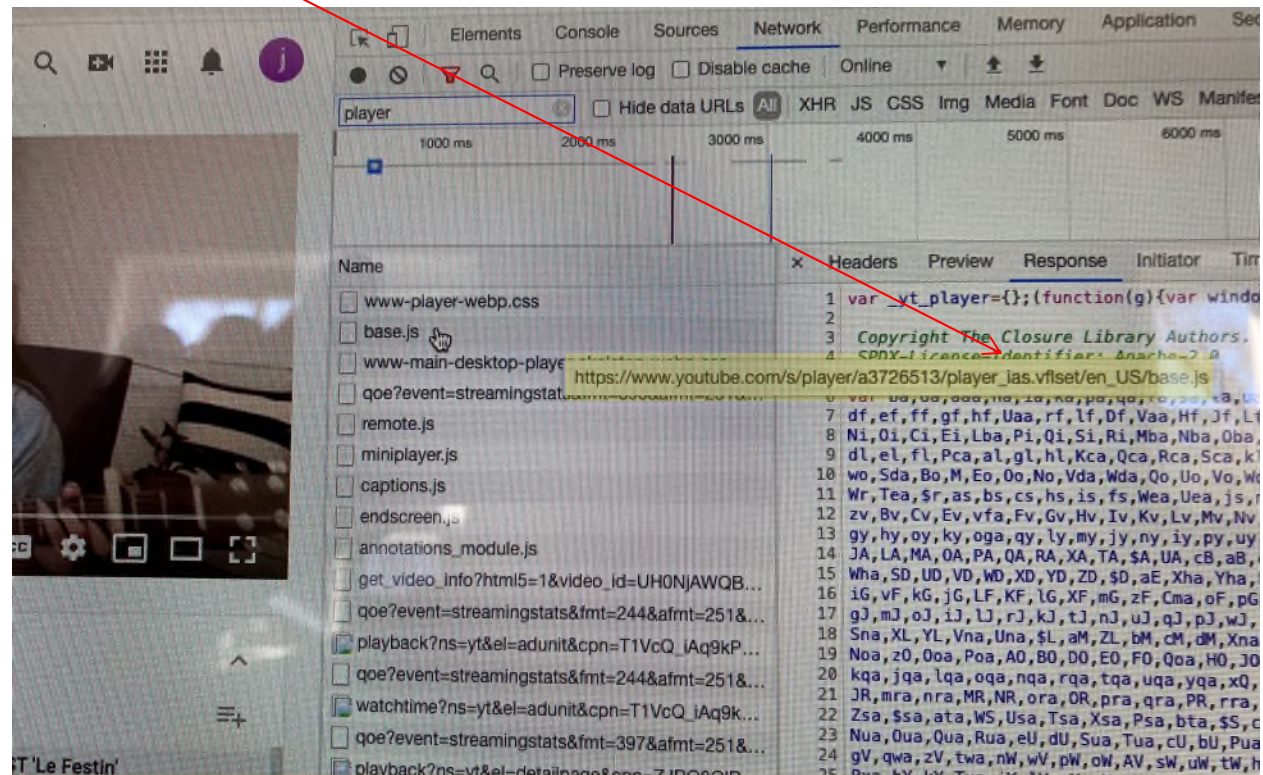
## 2. Web-based Video Playback

When a video is launched, YouTube uses a Java player. Example below:

The screenshot displays a YouTube video player interface on the left, showing a video of a woman playing a guitar. Below the video, the title 'Mix - [Cover by Stella Jang] Ratatouille OST 'Le Festin'' is visible. On the right, the Chrome DevTools console is open, showing the 'base.js' file in the 'JS' tab. The console output shows the initialization of the YouTube player, including the 'var \_yt\_player' variable and the 'Copyright The Closure Library Authors.' message. A red arrow points from the text 'YouTube uses a Java player' to the 'base.js' file in the console.

YouTube Video, <https://www.youtube.com/watch?v=beamS4GZ5T8> ("Video").

The YT Player player is served by YouTube to the user:



Video.

<p><b>receiving</b> audio and video segments encoded in a digital encoding format and with an encoding rate;</p>	<p><b>YouTube stream data identifies the protocol used for receiving encoded audio and video segments as MPEG-DASH.</b></p> <pre>&lt;?xml version="1.0" encoding="UTF-8"?&gt; &lt;MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="urn:mpeg:dash:schema:mpd:2011" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="urn:mpeg:dash:schema:mpd:2011 http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-DASH_schema_files/DASH-MPD.xsd" minBufferTime="PT1.5S" mediaPresentationDuration="PT144S" type="static" profiles="urn:mpeg:dash:profile:isoff-main:2011"&gt; Video MPD file (XML).</pre> <p>Video.</p>
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**receiving audio and video segments**  
encoded in a digital encoding format and with an encoding rate;

**Media on YouTube is comprised of video and audio segments:**

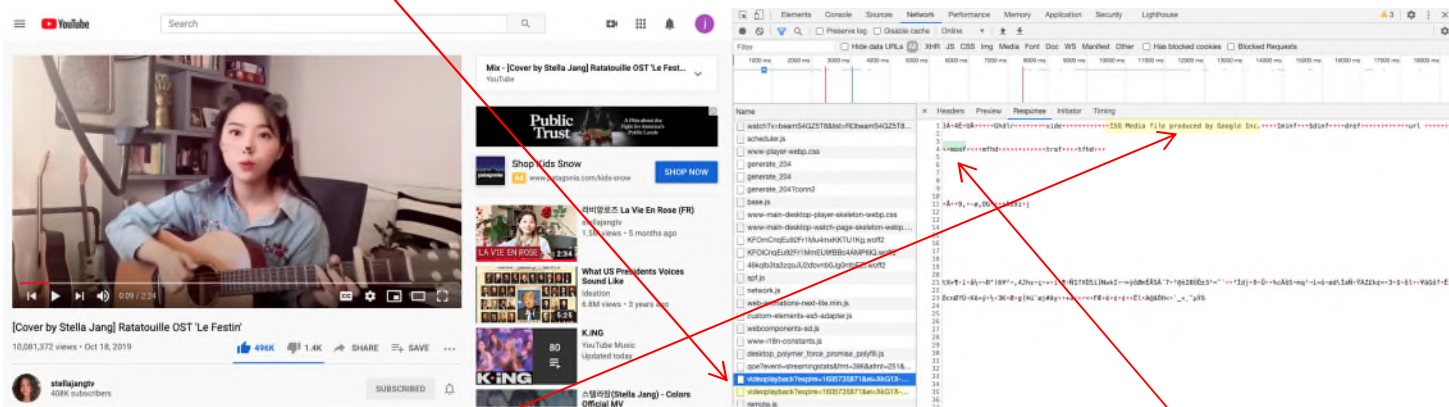


Video.



receiving audio and video segments encoded in a digital encoding format and with an encoding rate;

The video and audio segments are visible:



For the highlighted Representation of the media segments, here is the MOOF (green) (*infra* at 9).

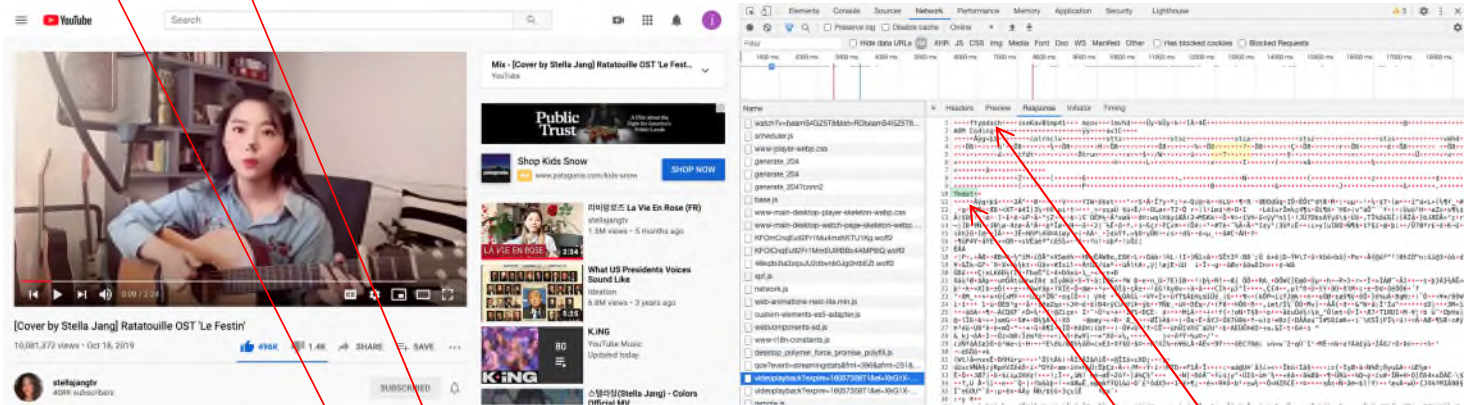
Note Google's signature on the segment creation (base media file format). This format is referenced on page 2.

Video.



receiving audio and video segments encoded in a digital encoding format and with an encoding rate;

The video and audio segments are visible:



Video.

Here is the MDAT (green) (infra at 9).

Note segments are explicitly stamped DASH by Google

<AdaptationSet id="0" mimeType="video/mp4" ...>

...  
<Representation id="133" codecs="avc1.4d4015" ...>

<AdaptationSet id="2" mimeType="audio/mp4" ...>

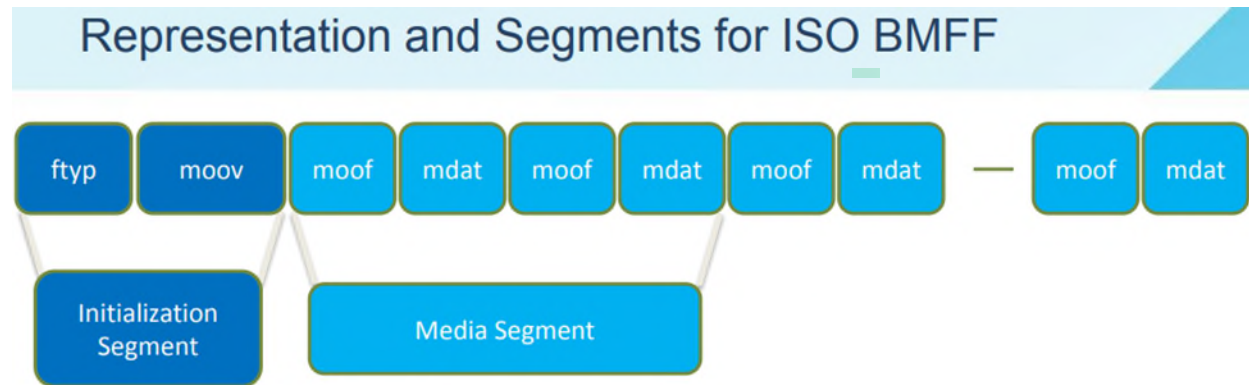
<Representation id="140" codecs="mp4a.40.2" bandwidth="130565">

Video.

**receiving audio and video segments** encoded in a digital encoding format and with an encoding rate;

**The MPEG-DASH standard requires segments:**


Segments possess moof and mdat data.



Ex. 19, Ye-Kui Wang & Thomas Stockhammer (slides mostly by Thomas Stockhammer [Dr. Thomas Stockhammer is the Technical Standards Director at Qualcomm and leads the ATSC 3.0 profile for DASH]) *An Introduction to DASH (Dynamic Adaptive Streaming over HTTP)*, at 14 (April 2015).

MOOF is a movie fragment.

MDAT is a box which can hold the actual media data for a presentation.

<p>receiving audio and video segments encoded in a digital encoding format and with an encoding rate;</p>	<p><b>As shown below, the YT Player receives data in two digital encoding formats: AVC1 and mp4a.</b></p> <p>The Media Presentation Description ("MPD") file for this MPEG-DASH data shows that the video is in the AVC1 format and the audio is in MP4A format:</p>  <pre> &lt;MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="urn:mpeg:dash:schema:mpd:2011" xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="urn:mpeg:dash:schema:mpd:2011 http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-DASH_schema_files/DASH-MPD.xsd" minBufferTime="PT1.5S" mediaPresentationDuration="PT144S" type="static" profiles="urn:mpeg:dash:profile:isoff- main:2011"&gt;  &lt;Period&gt;     &lt;AdaptationSet id="0" mimeType="video/mp4" ...&gt;         ...         &lt;Representation id="133" codecs="avc1.4d4015" ..."&gt;             ...     &lt;AdaptationSet id="2" mimeType="audio/mp4" ...&gt;         ...         &lt;Representation id="140" codecs="mp4a.40.2" bandwidth="130565"&gt;             ...     &lt;/AdaptationSet&gt; &lt;/Period&gt; </pre> <p>Video (excerpt).</p> <p>These two data formats are codecs. AVC1 (green), also known as H264, is a video encoding format, whereas MP4A (green) is used here as an audio encoding format.</p>
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receiving audio and video segments encoded in a digital encoding format and with an encoding rate;	<p>The YT Player also receives, for selection, segments with multiple encoding rates tied to bandwidth (yellow):</p> <p><b>144p:</b> &lt;Representation id="160" codecs="avc1.4d400c" startWithSAP="1" bandwidth="93785" width="256" height="144" frameRate="24000/1001"&gt; <b>240p:</b> &lt;Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240" frameRate="24000/1001"&gt; <b>480p:</b> &lt;Representation id="135" codecs="avc1.4d401e" startWithSAP="1" bandwidth="337134" width="854" height="480" frameRate="24000/1001"&gt; <b>360p:</b> &lt;Representation id="134" codecs="avc1.4d401e" startWithSAP="1" bandwidth="223902" width="640" height="360" frameRate="24000/1001"&gt; <b>720p:</b> &lt;Representation id="136" codecs="avc1.4d401f" startWithSAP="1" bandwidth="690142" width="1280" height="720" frameRate="24000/1001"&gt;</p> <p>Video (exemplary excerpt).</p>			
receiving audio and video segments encoded in a digital encoding format and with an encoding rate;	<p>The MPEG-DASH standard requires encoding rates:</p> <table><tr><td>@bandwidth</td><td>M</td><td><p>Consider a hypothetical constant bitrate channel of bandwidth with the value of this attribute in bits per second (bps). Then, if the Representation is continuously delivered at this bitrate, starting at any SAP that is indicated either by @startWithSAP or by any Segment Index box, a client can be assured of having enough data for continuous playout providing playout begins after @minBufferTime * @bandwidth bits have been received (i.e. at time @minBufferTime after the first bit is received).</p><p>For dependent Representations, this value specifies the bandwidth according to the above definition for the aggregation of this Representation and all complementary Representations.</p><p>For details, see subclause 5.3.5.4.</p></td></tr></table> <p>Ex. 14, Information technology — Dynamic adaptive streaming over HTTP (DASH), ISO/IEC 23009-1, at Table 9, p. 46 (3rd Ed. 2019).<sup>1</sup></p>	@bandwidth	M	<p>Consider a hypothetical constant bitrate channel of bandwidth with the value of this attribute in bits per second (bps). Then, if the Representation is continuously delivered at this bitrate, starting at any SAP that is indicated either by @startWithSAP or by any Segment Index box, a client can be assured of having enough data for continuous playout providing playout begins after @minBufferTime * @bandwidth bits have been received (i.e. at time @minBufferTime after the first bit is received).</p> <p>For dependent Representations, this value specifies the bandwidth according to the above definition for the aggregation of this Representation and all complementary Representations.</p> <p>For details, see subclause 5.3.5.4.</p>
@bandwidth	M	<p>Consider a hypothetical constant bitrate channel of bandwidth with the value of this attribute in bits per second (bps). Then, if the Representation is continuously delivered at this bitrate, starting at any SAP that is indicated either by @startWithSAP or by any Segment Index box, a client can be assured of having enough data for continuous playout providing playout begins after @minBufferTime * @bandwidth bits have been received (i.e. at time @minBufferTime after the first bit is received).</p> <p>For dependent Representations, this value specifies the bandwidth according to the above definition for the aggregation of this Representation and all complementary Representations.</p> <p>For details, see subclause 5.3.5.4.</p>		

<sup>1</sup> The second through fifth editions of the MPEG-DASH standard do not possess any changes that impact Google and YouTube in this litigation. Changes made to the third edition from second are described in Exhibit 14 (Third Ed.) at pages 6-7. Changes made to the fourth edition from the third are described in Exhibit 20 (Fourth Ed.) at 7-8. Changes made to the fifth edition from the fourth are described in Exhibit 21 (Fifth Ed.) at 7.

wherein, said audio and video segments are associated with object parameters and supplied host path identification to form multimedia objects;

**The media has a YouTube MPD that defines several segment streams associated with object parameters, such as size (height X width), frame rate and encoding rates:**

```
<MPD ... mediaPresentationDuration="PT144S" ...>
  <Period>
    <AdaptationSet id="0" mimeType="video/mp4" ...>
      <Role schemeIdUri="urn:mpeg:DASH:role:2011" value="main"/>
      <Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=133&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
1731819&dur=144.143&imt=1572601141606755&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQIhAOEA94RUMTgd5OR8ONUKa_ZV8KTMYT-bCba-
N0nE-
WdmAiA3Sk4GMcxhQmu6yLqFhnaLo08RBnWJGki44FxDeAiQ5Q==&isparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&isig=AG3C_xAwRQIgOL
sAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1hEcCS49CCZlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="135" codecs="avc1.4d401e" startWithSAP="1" bandwidth="337134" width="854" height="480"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=135&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
5086723&dur=144.143&imt=1572601141608802&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQIhAEVcwUupOlB979-
kSV5tuHfVkJfrSGv3nSowV0AzJfsCIHVhXsUedGbXO0iY_cn9M62H0siMspFj01OwCCH-
GjDi&isparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&isig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe
0axLBBKoKYu8yYzrcHQ1hEcCS49CCZlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="134" codecs="avc1.4d401e" startWithSAP="1" bandwidth="223902" width="640" height="360"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=134&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
3315031&dur=144.143&imt=1572601141632693&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQIhAOqh5ZOnTI0qH8HPdUWbf8fob91gasix8G4dLQ8k-
sqAiBXuUmney8sM6S_Kmhka3osUa3-
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B7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1hEcCS49CCZlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="160" codecs="avc1.4d400c" startWithSAP="1" bandwidth="93785" width="256" height="144"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=160&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
```

```

p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen=
1207858&amp;dur=144.143&amp;lmt=1572601141607791&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRQlHAndabKIHwuzFZbazvEK0_CkJOXOVf3cgdyLQs05RX
W8WAiBbo2uUuT_3nl-
1ZGvZViu_WuYmAJivw3Tx6RDJdN2E6g==&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0
QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzlnZYxoitg==</BaseURL>
...
</Representation>
<Representation id="136" codecs="avc1.4d401f" startWithSAP="1" bandwidth="690142" width="1280" height="720"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o-
AFV1hi0nYBq0Rw9li7YIzQUZAydkyXvkpzQkTYZr_wOK&amp;itag=136&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen=
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sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRAlgYAtlsozwFNXhP9CN63Wb0VXUbm8zHPvOA2PEZn
zGvoCID5bwD-QGfsrnOlgpj0w3-
JY3SjtcozQ5gjregVqObi3&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB
7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzlnZYxoitg==</BaseURL>
...
</Representation>
</AdaptationSet>
...
</Period>
</MPD>

Video.

```

wherein, said audio and video **segments are associated with object parameters** and supplied host path identification to form multimedia objects;

**The MPEG-DASH standard discloses object parameters, and some object parameters are identified below:**

@width	0	<p>specifies the horizontal visual presentation size of the video media type on a grid determined by the @sar attribute.</p> <p>In the absence of @sar width and height are specified as if the value of @sar were "1:1"</p> <p>NOTE The visual presentation size of the video is equal to the number of horizontal and vertical samples used for presentation after encoded samples are cropped in response to encoded cropping parameters, "overscan" signaling, or "pan/scan" display parameters, e.g. SEI messages.</p> <p>If not present on any level, the value is unknown.</p>
@height	0	<p>specifies the vertical visual presentation size of the video media type, on a grid determined by the @sar attribute.</p> <p>If not present on any level, the value is unknown.</p>

Ex. 14, ISO/IEC 23009-1, at Table 13, internal p. 54.

@frameRate	0	<p>specifies the output frame rate (or in the case of interlaced, half the output field rate) of the video media type in the Representation. If the frame or field rate is varying, the value is the average frame or half the average field rate field rate over the entire duration of the Representation.</p> <p>The value is coded as a string, either containing two integers separated by a "/", ("F/D"), or a single integer "F". The frame rate is the division F/D, or F, respectively, per second (i.e. the default value of D is "1").</p> <p>If not present on any level, the value is unknown.</p>
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*Id.* at internal p. 55.



wherein, said audio and video segments are associated with object parameters and supplied host path identification to form multimedia objects;

The MPD defines several segment streams that are also associated with host path identifiers, such as URLs:

```
<MPD ... mediaPresentationDuration="PT144S" ...>
  <Period>
    <AdaptationSet id="0" mimeType="video/mp4" ...>
      <Role schemeIdUri="urn:mpeg:dash:role:2011" value="main"/>
      <Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=133&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
1731819&dur=144.143&imt=1572601141606755&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQlhAOEA94RUMTgd5OR8ONUKa_ZV8KTMYT-bCba-
N0nE-
WdmAia3Sk4GMcxhQmu6yLqFhnaLoO8RBnWJGki44FxDeAiQ5Q==&isparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&isig=AG3C_xAwRQlGOL
sAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="135" codecs="avc1.4d401e" startWithSAP="1" bandwidth="337134" width="854" height="480"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=135&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
5086723&dur=144.143&imt=1572601141608802&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRAIgEVcwUiuipOlb979-
kSV5tuHfVkJfSGv3nSowV0AzJfsCIHVhXsUedGbXO0iY_cn9M62H0siMspFj01OwCCH-
GjDi&isparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&isig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe
0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="134" codecs="avc1.4d401e" startWithSAP="1" bandwidth="223902" width="640" height="360"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=134&itags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
3315031&dur=144.143&imt=1572601141632693&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQlhAOqh5ZOnTl0qH8HPdUWBfp8fob91gasix8G4dLQ8k
sqAiBXuUmney8sM6S_Kmhka3osUa3-
Gz1PWm01V5ntttN3eg==&isparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&isig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepU
B7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzlnZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="160" codecs="avc1.4d400c" startWithSAP="1" bandwidth="93785" width="256" height="144"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=160&itags=160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
```

	<pre>ab5l6ndy&amp;ms=au,rdu&amp;mpv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen= 1207858&amp;dur=144.143&amp;lmt=1572601141607791&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;sp sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRQIHANdabKIHwuZFzbazvEK0_CkjOXOvF3cgdyLQs05RX W8WAiBbo2uUuT_3nl- 1ZGvZViu_WuYmAJivw3Tx6RDjdN2E6g==&amp;lparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoitg==&lt;/BaseURL&gt;</pre> <p>...</p> <pre>&lt;/Representation&gt; &lt;Representation id="136" codecs="avc1.4d401f" startWithSAP="1" bandwidth="690142" width="1280" height="720" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo-ab5l6ndy.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlzQUZAydKyXvkpzQkTYZr_wOK&amp;itag=136&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp;am p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,s- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen= 10698681&amp;dur=144.143&amp;lmt=1572601141611448&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;sp sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRAIgyAtIsowzFNXhP9CN63Wb0VXuBm8zHPvrOA2PEZn zGvoCID5bwD-QGfsrnOlpgj0w3- JY3SjtcozQ5giregVqObi3&amp;lparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB 7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoitg==&lt;/BaseURL&gt;</pre> <p>...</p> <pre>&lt;/Representation&gt; &lt;/AdaptationSet&gt;</pre> <p>...</p> <pre>&lt;/Period&gt; &lt;/MPD&gt;</pre> <p>Video.</p>	
	<p>The MPEG-DASH standard discloses a host path identification:</p> <div style="border: 1px solid black; padding: 10px;"> <h3>5.6 Base URL Processing</h3> <h4>5.6.1 Overview</h4> <p>The <b>BaseURL</b> element may be used to specify one or more common locations for Segments and other resources. Reference resolution as defined in subclause 5.6.4 shall be applied to each URL in the MPD. Handling of multiple alternative base URLs is addressed in subclause 5.6.5.</p> <p>The semantics of the attributes and elements for the Base URL are provided in 5.6.2, Table 26. The XML syntax of the Base URL is provided in subclause 5.6.3.</p> </div>	

Ex. 14, ISO/IEC 23009-1, at internal p. 85.

wherein, said audio and video segments are associated with object parameters and supplied host path identification to form multimedia objects;

**These YouTube segments with associated objects and URLs are multimedia objects (green):**

```
<MPD ... mediaPresentationDuration="PT144S" ...>
  <Period>
    <AdaptationSet id="0" mimeType="video/mp4" ...>
      <Role schemeIdUri="urn:mpeg:DASH:role:2011" value="main"/>
      <Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=133&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&
amp;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&cle
n=1731819&dur=144.143&lt=1572601141606755&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432
&spams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lt&sig=AOq0QJ8wRQlhAOEA94RUMTgd5OR8ONUKa_ZV8KTMYT
-bCba-N0nE-
WdmAiA3Sk4GMcxhQmu6yLqFhnaLoO8RBnWJGki44FxDeAiQ5Q==&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlg
OLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzInZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="135" codecs="avc1.4d401e" startWithSAP="1" bandwidth="337134" width="854" height="480"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=135&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&
amp;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&cle
n=5086723&dur=144.143&lt=1572601141608802&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432
&spams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lt&sig=AOq0QJ8wRAIgEVcwUiupOlB979-
kSV5tuHfVkJfrSGv3nSowV0AzJfsCIHVhxSUedGbXO0iY_cn9M62H0siMspFj01OwCCH-
GjDi&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCP
Ne0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzInZYxoigt==</BaseURL>
...
      </Representation>
      <Representation id="134" codecs="avc1.4d401e" startWithSAP="1" bandwidth="223902" width="640" height="360"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=134&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&
amp;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&cle
n=3315031&dur=144.143&lt=1572601141632693&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432
&spams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lt&sig=AOq0QJ8wRQlhAOqh5ZOnTi0qH8HPdUWBfp8fob91gasix8
G4dLQ8k_sqAiBXuUmney8sM6S_Kmhka3osUa3-
Gz1PWm01V5ntttN3eg==&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3ue
pUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCzInZYxoigt==</BaseURL>
...
      </Representation>
```

	<pre> &lt;Representation id="160" codecs="avc1.4d400c" startWithSAP="1" bandwidth="93785" width="256" height="144" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo- ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&amp;itag=160&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp; &amp;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;cle n=1207858&amp;dur=144.143&amp;lmt=1572601141607791&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432 &amp;sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRQlhANdabKIHwuZFZbavEK0_CkjOXOvF3cgdy LQs05RXW8WAiBbo2uUuT_3nl- 1ZGvZViu_WuYmAJjvw3Tx6RDJdN2E6g==&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzY Uo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==&lt;/BaseURL&gt; ... &lt;/Representation&gt;  &lt;Representation id="136" codecs="avc1.4d401f" startWithSAP="1" bandwidth="690142" width="1280" height="720" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo- ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&amp;itag=136&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp; &amp;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;cle n=10698681&amp;dur=144.143&amp;lmt=1572601141611448&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432 &amp;sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lmt&amp;sig=AOq0QJ8wRAIgYAtlsozwFNXhP9CN63Wb0VXUbm8zHPv OA2PEZnzGvoCID5bwD-QGfsmOlgpj0w3- JY3SjtcozQ5gJregVqObi3&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uep UB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==&lt;/BaseURL&gt; ... &lt;/Representation&gt; &lt;/AdaptationSet&gt;  ... &lt;/Period&gt; &lt;/MPD&gt;  Video. </pre>
--	--

requesting by a multimedia player, transmission of said multimedia objects;

The YT Player requests transmission of multimedia objects:

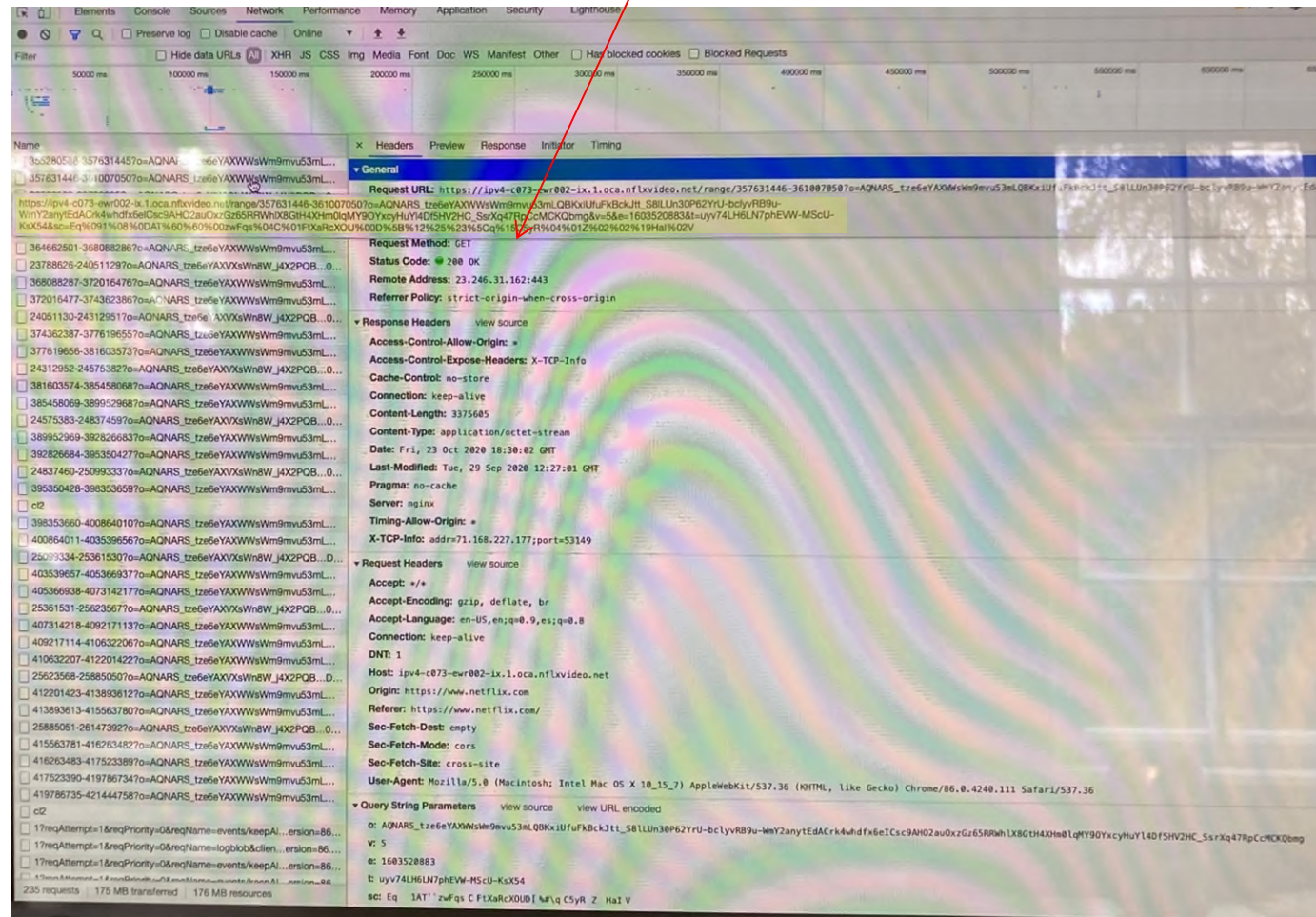
The screenshot shows a YouTube video player with a woman playing guitar. The browser's developer tools are open to the Network tab, displaying a list of requests. A red arrow points from the text 'The YT Player requests transmission of multimedia objects:' to a specific network request in the list. The request is a GET request to a URL starting with 'https://i1--rt--fapi--ab51--googleusercontent.com/video/playlist/...'. The response headers show 'accept-ranges: bytes', 'access-control-allow-credentials: true', and 'access-control-allow-origin: https://www.youtube.com'. The status code is 200.

Video.



wherein said multimedia objects are located using http and received by said multimedia player from servers using a wireless connection;

The YT Players locates the multimedia objects through a URL:



Video.

wherein said **multimedia objects** are located using http and **received by said multimedia player from servers** using a wireless connection;

**The YT Player receives multimedia objects from Google's content servers:**

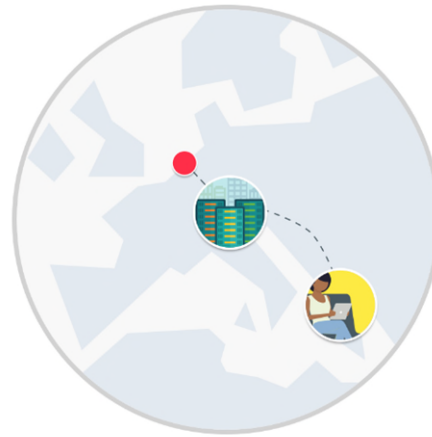


The journey starts when a user opens a Google app or requests one of our web pages.

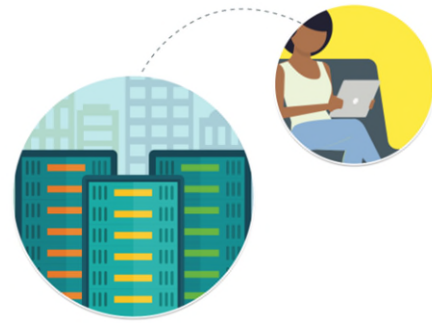


Google responds to the user's request from an Edge Network location that will provide the lowest latency.

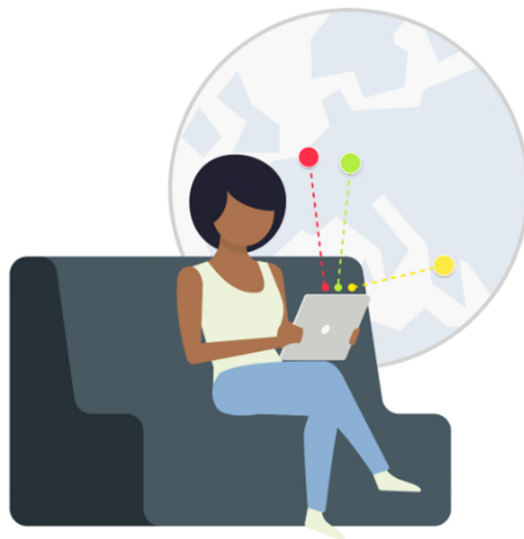




Our Edge Network receives the user's request and passes it to the nearest Google data center.



The data center generates a response that's optimized to provide the best experience for the user at that time.



The app or browser retrieves the requested content. This can come from multiple Google locations, including our data centers, Edge POPs, and Edge Nodes.

<https://peering.google.com/#/> (last accessed, Mar. 31, 2024).

For example:

Static content that's very popular with the local host's user base, including YouTube and Google Play, is temporarily cached on edge nodes. Google's traffic management systems direct user requests to an edge node that provides the best experience.

<https://peering.google.com/#/infrastructure> (last visited Mar. 31, 2024).

	<p>See also, <i>Seven Networks, LLC v. Google LLC</i>, 315 F. Supp. 3d 933, 948 (E.D. Tex. 2018):</p> <p>“Caching and localization are vital for [Google’s] optimization of network resources.” Because “hosting all content everywhere is inefficient, it makes sense to cache popular content and serve it locally.” Doing so brings delivery costs down for Google, network operators, and internet service providers. Storing content locally also allows it to be delivered more quickly, which improves user experience: “Serving content from the edge of the network closer to the user improves performance [and] user happiness.” To achieve these benefits, Google has placed Edge Nodes throughout the United States, including in this District. Google describes these nodes as the “workhorse[s] of video delivery.”</p>
<p>wherein said <b>multimedia objects</b> are located using http and <b>received</b> by said multimedia player from servers <b>using a wireless connection</b>;</p>	<p><b>Multimedia objects from YouTube can be received using a wireless connection:</b></p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>When you open YouTube in a mobile app or browser, you'll land on Home 🏠. Here you'll see videos recommended for you. Your preferences and activity on YouTube will influence your video recommendations.</p> </div> <p>Use YouTube on mobile browsers, <a href="https://support.google.com/youtube/answer/3008060?hl=en">https://support.google.com/youtube/answer/3008060?hl=en</a> (last visited Mar. 31, 2024)</p> <p>See also, below:</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <h3>Use YouTube on mobile browsers</h3> <p>You can use YouTube for Mobile Web or Desktop mode on your phone.</p> <h4>Sign In</h4> <p>To get the most out of YouTube, sign in to view your favorite videos, playlists, and more.</p> <p>To sign in:</p> <ol style="list-style-type: none"> <li>1. In the upper-right hand corner of the screen, tap the profile picture 🧑.</li> <li>2. Tap <b>Sign in</b>.</li> <li>3. Enter your email address and password.</li> <li>4. Tap <b>Sign in</b>.</li> </ol> </div> <p><i>Id.</i></p>

playing back received multimedia objects by the multimedia player, wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by

The YouTube playback of multimedia objects is sequential:

The screenshot displays a YouTube video player for the video "[Cover by Stella Jang] Ratatouille OST 'Le Festin'" by the channel stellajangtv. The video player shows a woman playing an acoustic guitar. To the right, the browser's developer tools are open to the Network tab, showing a list of video segments being loaded sequentially. A red arrow points to the first segment in the list, which is highlighted in green. The segments are listed with their names and expiration times.

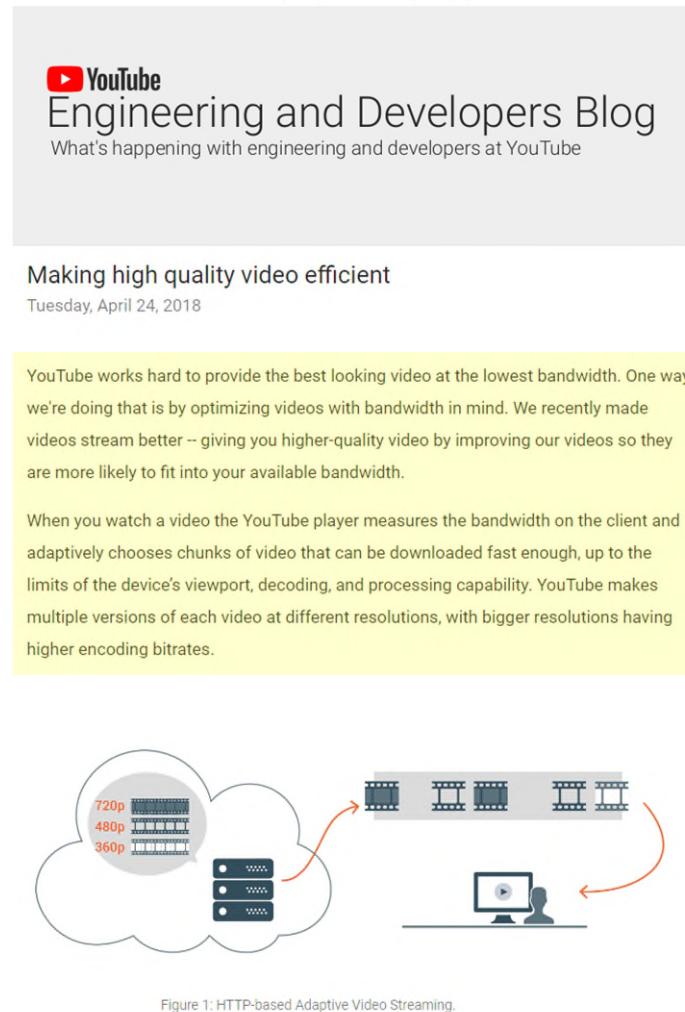
Name	Expiration Time
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...00&ir=1&m=12&range=150749-475499&m=14&buf=5666	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=475500-1210519&m=18&buf=10010	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=1210520-2313784&m=20&buf=15133	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=2313785-3774199&m=22&buf=22145	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=3774200-5601655&m=24&buf=32666	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=5601656-7429985&m=26&buf=44945	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=7429986-9241350&m=27&buf=57470	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=9241351-10084970&m=29&buf=69746	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...&ir=1&m=12&range=10084971-10798&m=31&buf=0	1605755433
videoplayback?expire=1605755433&ei=yY21X6uYKY-iHwb...201117.01.00&ir=1&m=12&range=0-10798&m=32&buf=0	1605755433

In this media example, the currently playing sequence of multimedia objects are the Representation segments (green). Notice the playback of segments is sequential.

	<p><b>The MPEG-DASH standard discloses sequential multimedia object playback.</b></p> <div><p>Segments and Subsegments represent units for which the client has an exact map on how to access and download the unit using HTTP GET or HTTP partial GET methods.</p><p>Segments (respectively Subsegments) are typically generated by segmenting encoded media streams into appropriate units. If the generation of Segments (respectively Subsegments) adheres to certain rules, then the sequential decoding and presentation of Media Segments (respectively Subsegments) results in a correct presentation of all contained media streams. To define such rules the notion of “non-overlapping” segments (respectively Subsegments) is defined as follows.</p></div> <p>Ex. 14, ISO/IEC 23009-1, at § 4.5.3, internal p. 15.</p>
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playing back received multimedia objects by the multimedia player, wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by

YouTube playback fluidity, video quality, and audio quality are maintained based on multiple versions of each stream that fit available bandwidth:



Ex. 18, *Making high quality video efficient*, YouTube Engineering and Developers Blog, <https://youtube-eng.googleblog.com/2018/04/making-high-quality-video-efficient.html> (Apr. 24, 2018), at 1.



<p>playing back received multimedia objects by the multimedia player, wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by</p>	<p><b>YouTube playback fluidity, video quality, and audio quality are maintained based on multiple versions (yellow) of each video that reflect available bandwidth (green):</b></p> <pre> &lt;MPD ... mediaPresentationDuration="PT144S" ...&gt;   &lt;Period&gt;     &lt;AdaptationSet id="0" mimeType="video/mp4" ...&gt;       &lt;Role schemeIdUri="urn:mpeg:DASH:role:2011" value="main"/&gt;       ...       &lt;Representation id="160" codecs="avc1.4d400c" startWithSAP="1" bandwidth="93785" width="256" height="144" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo- ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&amp;itag=160&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp;am p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen= 1207858&amp;dur=144.143&amp;imt=1572601141607791&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;sp arams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&amp;sig=AOq0QJ8wRQlHAndabKIhWuZfZbavzEK0_CkjOXOVf3cgdyLQs05RX W8WAiBbo2uUuT_3nl- 1ZGvZViu_WuYmAJiww3Tx6RDJdN2E6g==&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0 QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==&lt;/BaseURL&gt;       ...       &lt;Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo- ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&amp;itag=133&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp;am p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen= 1731819&amp;dur=144.143&amp;imt=1572601141606755&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;sp arams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&amp;sig=AOq0QJ8wRQlHAE94RUMTgd5OR8ONUKa_ZV8KMTMYT-bCba- N0nE- WdmAia3Sk4GMcxhQmu6yLqFhnaLoO8RBnWJGki44FxDeAiQ5Q==&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOL sAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==&lt;/BaseURL&gt;       ...       &lt;/Representation&gt;       &lt;Representation id="135" codecs="avc1.4d401e" startWithSAP="1" bandwidth="337134" width="854" height="480" frameRate="24000/1001"&gt;&lt;BaseURL&gt;https://r2---sn-8xgp1vo- ab5l.googlevideo.com/videoplayback?expire=1605735198&amp;ei=vj61X9bkKpfqhwx4pqACg&amp;ip=71.168.227.177&amp;id=o- AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&amp;itag=135&amp;aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&amp;am p;source=youtube&amp;requiressl=yes&amp;mh=y2&amp;mm=31,29&amp;mn=sn-8xgp1vo-ab5l,sn- ab5l6ndy&amp;ms=au,rdu&amp;mv=m&amp;mvi=2&amp;pl=17&amp;initcwndbps=2136250&amp;vprv=1&amp;mime=video/mp4&amp;gir=yes&amp;clen= 5086723&amp;dur=144.143&amp;imt=1572601141608802&amp;mt=1605713472&amp;fvip=2&amp;keepalive=yes&amp;c=WEB&amp;txp=5535432&amp;sp arams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&amp;sig=AOq0QJ8wRAIgEVcwUiupOlB979- kSV5tuHfVkJfrSGv3nSowV0AzJfsCIHVhXsUedGbXO0iY_cn9M62H0siMspFj01OwCCH- GjDi&amp;HfVkJfrSGv3nSowV0AzJfsCIHVhXsUedGbXO0iY_cn9M62H0siMspFj01OwCCH- GjDi&amp;lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&amp;lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe 0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==&lt;/BaseURL&gt;       ...       &lt;/Representation&gt; </pre>
--	---



```

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AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=134&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
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ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
3315031&dur=144.143&imt=1572601141632693&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
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sqAiBXuUmney8sM6S_Kmhka3osUa3-
Gz1PWm01V5ntttN3eg==&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepU
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...
</Representation>

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AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=136&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
10698681&dur=144.143&imt=1572601141611448&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRAIgYAtlsozwFNXhP9CN63Wb0VXUbm8zHPvOA2PEZn
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JY3SjtcozQ5gJregVqObi3&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlGOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB
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...
</Representation>
</AdaptationSet>
...
</Period>
</MPD>

Video.

```

**For adaptive multi-bit-rate playback, MPEG-DASH discloses that the player assesses network bandwidth availability to select multimedia objects:**

**4.5 Media stream and Representation properties**

**4.5.1 Switching and Random Access Support**

The formats defined in this document are designed for providing good user experience even in case the access bandwidth between the DASH segment delivery function or the cache varies. A key functionality is the ability of the DASH Client to seamlessly switch across different Representations of the same media component without severely impacting the user experience.

Ex. 14, ISO/IEC 23009-1, at internal p. 24.

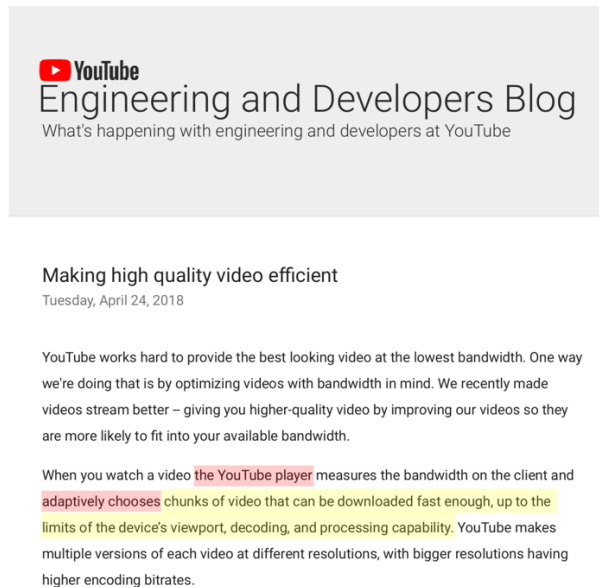
playing back received multimedia objects by the multimedia player, wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by

The YT Player selects the Representation based on bandwidth:

Using playback statistics, we are able to model the behavior of the player as it switches between resolutions. This allows us in effect to predict when an increased bitrate would be more likely to cause a player to switch to a lower resolution and thereby cancel the effect of bitrate increase in any one resolution. With this model, we are able to find better operating points for each video in the real world.<sup>1</sup>

Ex. 18, *Making high quality video efficient*, YouTube Engineering and Developers Blog, <https://youtube-eng.googleblog.com/2018/04/making-high-quality-video-efficient.html> (Apr. 24, 2018).

**YouTube engineering documentation explicitly states that the YouTube player (on the client) autonomously (i.e., without server-side intervention) adjusts the video playback.**



*Id.*

playing back received multimedia objects by the multimedia player, wherein the multimedia player is configured to play multimedia objects in a sequence such that fluidity, video quality and audio quality are maintained by selecting a plurality of said multimedia objects that reflect available network bandwidth, autonomously adjusting said selection and playback according to the multimedia object parameters and supplied host path identification, and by

The YT Player autonomously adjusts selection and playback of media variants (green) according to the multimedia object parameters (blue):

```
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  <Period>
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      ...
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AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=160&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
1207858&dur=144.143&lt=1572601141607791&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&spams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lt&sig=AOq0QJ8wRQlHwZfZbavzEK0_CkjOXOVf3cgdyLQs05RX
W8WAiBbo2uUuT_3nl-
1ZGvZViu_WuYmAJiVw3Tx6RDJdN2E6g==&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0
QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==</BaseURL>
      ...
      <Representation id="133" codecs="avc1.4d4015" startWithSAP="1" bandwidth="115889" width="426" height="240"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
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AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=133&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
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ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
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      ...
    </Representation>
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frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
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AFV1hi0nYBq0Rw9li7YlZQUZAydkyXvkpzQkTYZr_wOK&itag=135&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rd&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
5086723&dur=144.143&lt=1572601141608802&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&spams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,lt&sig=AOq0QJ8wRAIgEVcwUiupOlB979-
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GjDi&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQIgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB7POINSDsCIQCPNe0axLBBKoKYu8yYzrcHQ1ihEcCS49CCZlnZYxoigt==</BaseURL>
    </Representation>
  </AdaptationSet>
</Period>
</MPD>
```

```

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AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=134&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
3315031&dur=144.143&imt=1572601141632693&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRQlhAOqh5ZOnTl0qH8HPdUWBfp8fob91gasix8G4dLQ8k-
sqAiBXuUmney8sM6S_Kmhka3osUa3-
Gz1PWm01V5ntttN3eg==&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepU
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...
</Representation>

<Representation id="136" codecs="avc1.4d401f" startWithSAP="1" bandwidth="690142" width="1280" height="720"
frameRate="24000/1001"><BaseURL>https://r2---sn-8xgp1vo-
ab5l.googlevideo.com/videoplayback?expire=1605735198&ei=vj61X9bkKpfqhwx4pqACg&ip=71.168.227.177&id=o-
AFV1hi0nYBq0Rw9li7YlzQUZAydkyXvkpzQkTYZr_wOK&itag=136&aitags=133,134,135,136,160,242,243,244,247,278,394,395,396,397,398&am
p;source=youtube&requiressl=yes&mh=y2&mm=31,29&mn=sn-8xgp1vo-ab5l,sn-
ab5l6ndy&ms=au,rdu&mv=m&mvi=2&pl=17&initcwndbps=2136250&vprv=1&mime=video/mp4&gir=yes&clen=
10698681&dur=144.143&imt=1572601141611448&mt=1605713472&fvip=2&keepalive=yes&c=WEB&txp=5535432&sp
sparams=expire,ei,ip,id,aitags,source,requiressl,vprv,mime,gir,clen,dur,imt&sig=AOq0QJ8wRAIgYAtlsozwFNXhP9CN63Wb0VXUbm8zHPvOA2PEZn
zGvoCID5bwD-QGfsmOlppj0w3-
JY3SjtcozQ5gJregVqObi3&lsparams=mh,mm,mn,ms,mv,mvi,pl,initcwndbps&lsig=AG3C_xAwRQlgOLsAprMcbVKdKqMNzYUo0QnNsNx2r3uepUB
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...
</Representation>
</AdaptationSet>
...
</Period>
</MPD>

```

Video.

**Selection and playback of media variants is also based on the host path identification (yellow).**

The MPEG-DASH standard requires the media stream to possess multimedia object parameters for selection and playback.

#### 4.3 DASH data model overview

\* \* \*

Each media content component may have several encoded versions, referred to as **media streams**. Each media stream inherits the properties of the media content, the media content period, the media content component from which it was encoded and, in addition, it gets assigned the properties of the encoding process such as sub-sampling, codec parameters, encoding bitrate, etc. This describing metadata is relevant for static and dynamic selection of media content components and media streams.

Ex. 14, ISO/IEC 23009-1, at internal p. 10.

The MPEG-DASH standard also discloses a host path identification.

Within a Representation, the content may be divided in time into **Segments** (see subclause 5.3.9 and Clause 6) for proper accessibility and delivery. In order to access a Segment, a URL is provided for each Segment. Consequently, a Segment is the largest unit of data that can be retrieved with a single HTTP request. For segmented Representations, two types of Segments are differentiated: **Initialization Segments** contain static metadata for the Representation, **Media Segments** contain media samples and advanced the timeline. Media may also be organized by a single self-initialitizing Segment which contains then both initialization information as well as media data.

**NOTE** This is not strictly true, since the MPD can also include a byte range with the URL, meaning that the Segment is contained in the provided byte range of some larger resource. An intelligent client can in principle construct a single request for multiple Segments, but this is not the typical case.

*Id.* at internal p. 12.

utilizing optimized decoding processes to maintain quality playback.

**YouTube uses optimized decoding to maintain quality playback.**

**Defendants use at least AVC1 to decode YouTube video:**

```
<MPD xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns="urn:mpeg:dash:schema:mpd:2011"
xmlns:xlink="http://www.w3.org/1999/xlink" xsi:schemaLocation="urn:mpeg:dash:schema:mpd:2011
http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-DASH_schema_files/DASH-MPD.xsd"
minBufferTime="PT1.5S" mediaPresentationDuration="PT144S" type="static" profiles="urn:mpeg:dash:profile:isoff-
main:2011">
```

```
<Period>
```

```
  <AdaptationSet id="0" mimeType="video/mp4" ...>
```

```
    ...
```

```
    <Representation id="133" codecs="avc1.4d4015" ...>
```

```
  <AdaptationSet id="2" mimeType="audio/mp4" ...>
```

```
    <Representation id="140" codecs="mp4a.40.2" bandwidth="130565">
```

Video (excerpt).

**AVC-1 encoding and decoding optimizations, including DCT, are described by the AVC-1 Specification:**

#### 8.5.12.2 Transformation process for residual 4x4 blocks

Inputs of this process are:

- the variable bitDepth,
- a 4x4 array of scaled transform coefficients  $d$  with elements  $d_{ij}$ .

Outputs of this process are residual sample values as 4x4 array  $r$  with elements  $r_{ij}$ .

\* \* \*

After performing both the one-dimensional horizontal and the one-dimensional vertical inverse transforms to produce an array of transformed samples, the final constructed residual sample values is derived as:

$$r_{ij} = (h_{ij} + 2^5) \gg 6 \quad \text{with } i, j = 0..3 \quad (8-354)$$

Ex. 23, *Information technology — Coding of audio-visual objects*, ISO/IEC 14496-10 (10th Ed., 2022-11) at 223-24.



**8.5.13.2 Transformation process for residual 8x8 blocks**

Inputs of this process are:

- the variable bitDepth,
- an 8x8 array of scaled transform coefficients d with elements  $d_{ij}$ .

Outputs of this process are residual sample values as 8x8 array r with elements  $r_{ij}$ .

\*                      \*                      \*

After performing both the one-dimensional horizontal and the one-dimensional vertical inverse transforms to produce an array of transformed samples, the final constructed residual sample values are derived as

$$r_{ij} = (m_{ij} + 2^5) \gg 6 \text{ with } i, j = 0..7 \quad (8-406)$$

*Id.* at 225-28.